

**TBPOC CONFERENCE CALL
May 23, 2013, 8:00am – 9:00am**

	Topic	Presenter	Time	Desired Outcome
1.	CHAIR'S REPORT	S. Heminger, BATA		Information
2.	SAN FRANCISCO-OAKLAND BAY BRIDGE UPDATES			
	a. BATA May 29 Special Meeting Draft Presentation*	PMT	30 min	Information
	b. Status of E2 Retrofit	PMT	15 min	Information
	c. Status of Testing	PMT	15 min	Information
3.	OTHER BUSINESS			
Next TBPOC Conference Call: May 28, 2013, 8:00am – 9:00am				

* Attachments

Briefing on E2 Anchor Bolts – May 29, 2013



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Items Expected From Briefing at Special May 29th BATA Meeting

- Pending results from testing of 2010 bolts, decision on whether to replace other Pier E2 bolts and, if so, when.
- Completion of desk review of additional QA/QC results for other high tension anchor bolt locations.



Why aren't we ready today

- Investigative report not complete due to slow production of relevant documents
- On-going design and construction progress on Pier E2 retrofit not sufficient to predict firm completion date
- Other on-going testing and development of required review protocol is necessary for bridge opening decision



Why a Labor Day Opening?

- **Three-day Weekend**
- **Traffic lull before school starts**
- **History of good weather**
- **Multiple days of contiguous bridge work being planned**
- **Project team delivery focus since 2010**



Seismic Safety Opening

- In late 2010, the TBPOC and the SAS contractor agreed to a target of August 28, 2013 for a “Seismic Safety Opening” (SSO) of the new east span.
- A seismic safety opening would open the bridge to traffic as soon as all structural work is complete, critical systems are operational, and any above deck falsework is removed.



Seismic Safety opening

- **Pre-SSO work required before traffic include:**
 - **Structural work complete**
 - **Critical systems operational**
 - **All above deck and tower falsework removal activities complete.**
- **Post-SSO work allowed after traffic include:**
 - **Below deck falsework removal**
 - **Maintenance elevator installation**
 - **Touch-up painting**
 - **Some final system connections**



Drop Dead Date: July 10th

- **Plan A – Blow the all clear signal for Labor Day.**
- **Plan B – Announce postponement and new opening date.**



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Three Key Questions

- 1. What caused the E2 anchor bolts manufactured in 2008 to fail?**
- 2. What retrofit strategy should be used to replace the 2008 anchor bolts?**
- 3. What should be done about other similar bolts on the SAS?**





1. What caused the E2 anchor bolts manufactured in 2008 to fail?



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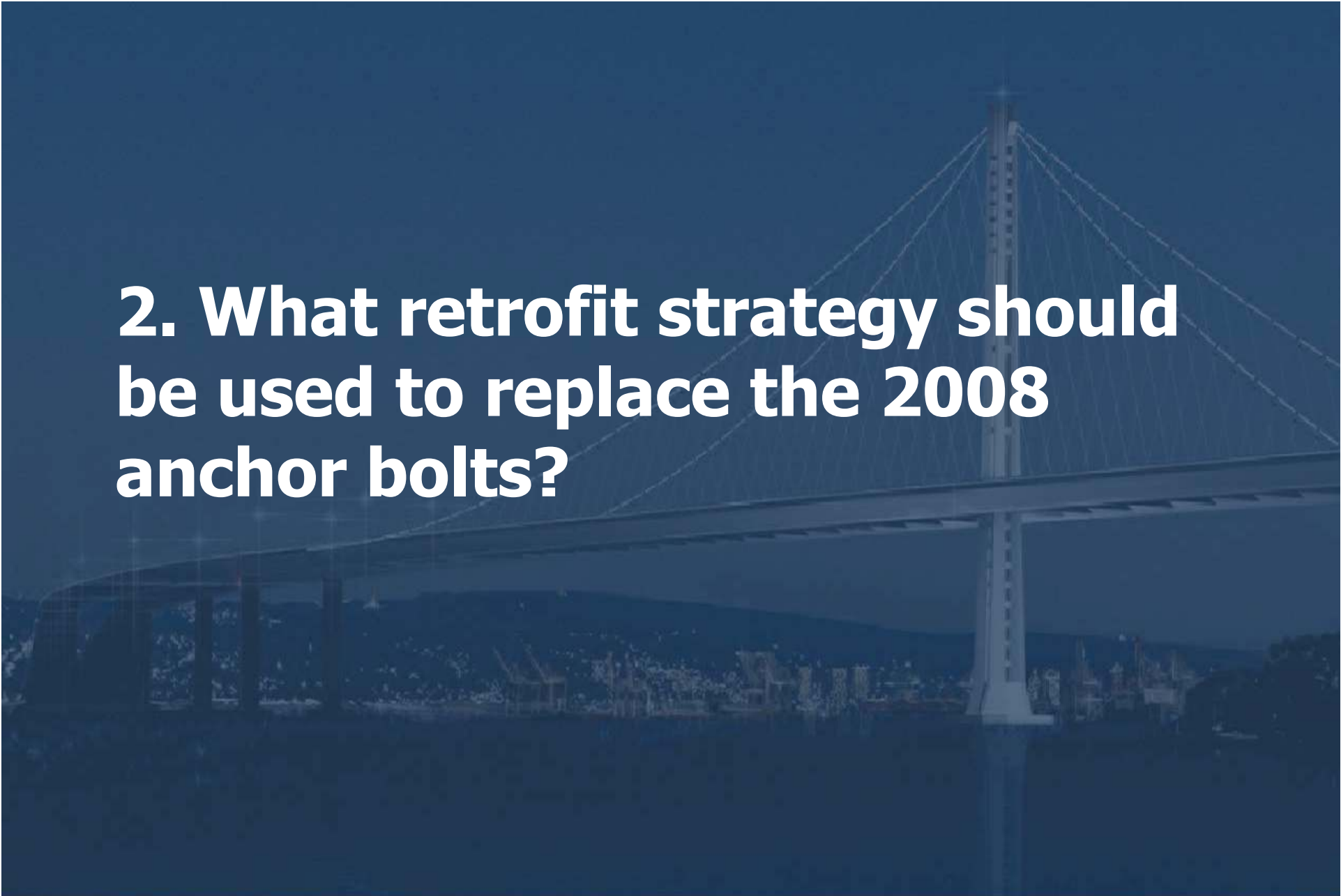
Failure of 2008 Bolts Due to Hydrogen Embrittlement

- **Hold for determination of responsibility.**



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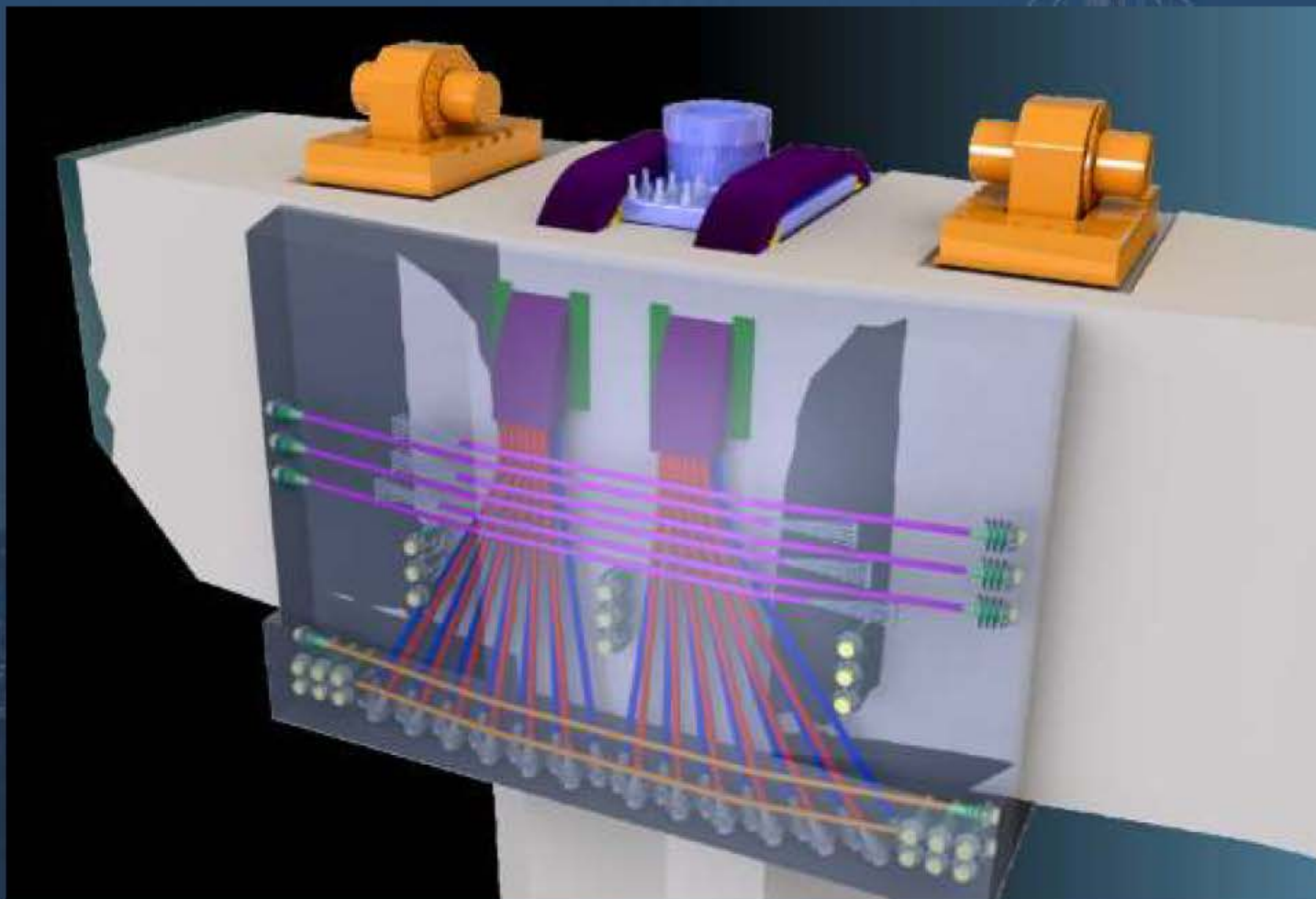
2. What retrofit strategy should be used to replace the 2008 anchor bolts?



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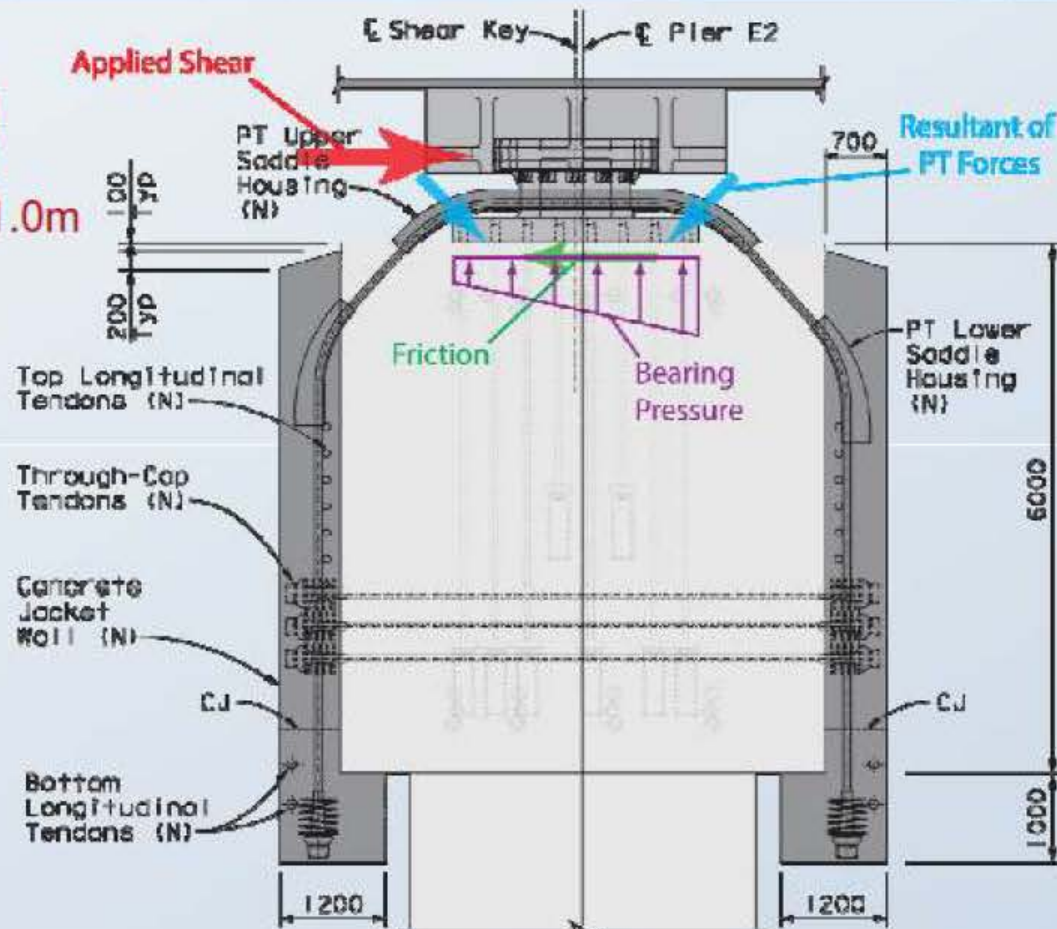
Steel Saddle Retrofit Option



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- Applied Shear:
- Trans: 42.5MN
 - Longi: 19.0MN
 - Moment Arm: 1.0m



CROSS SECTION AT SHEAR KEY



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Retrofit Construction Progress

- Design moving to shop drawing phase.
- Detailed review of E2 to install through cap tendons and saddles to avoid existing post tensioning in cap.
- Material Procurement





3. What should be done about other similar bolts on SAS?



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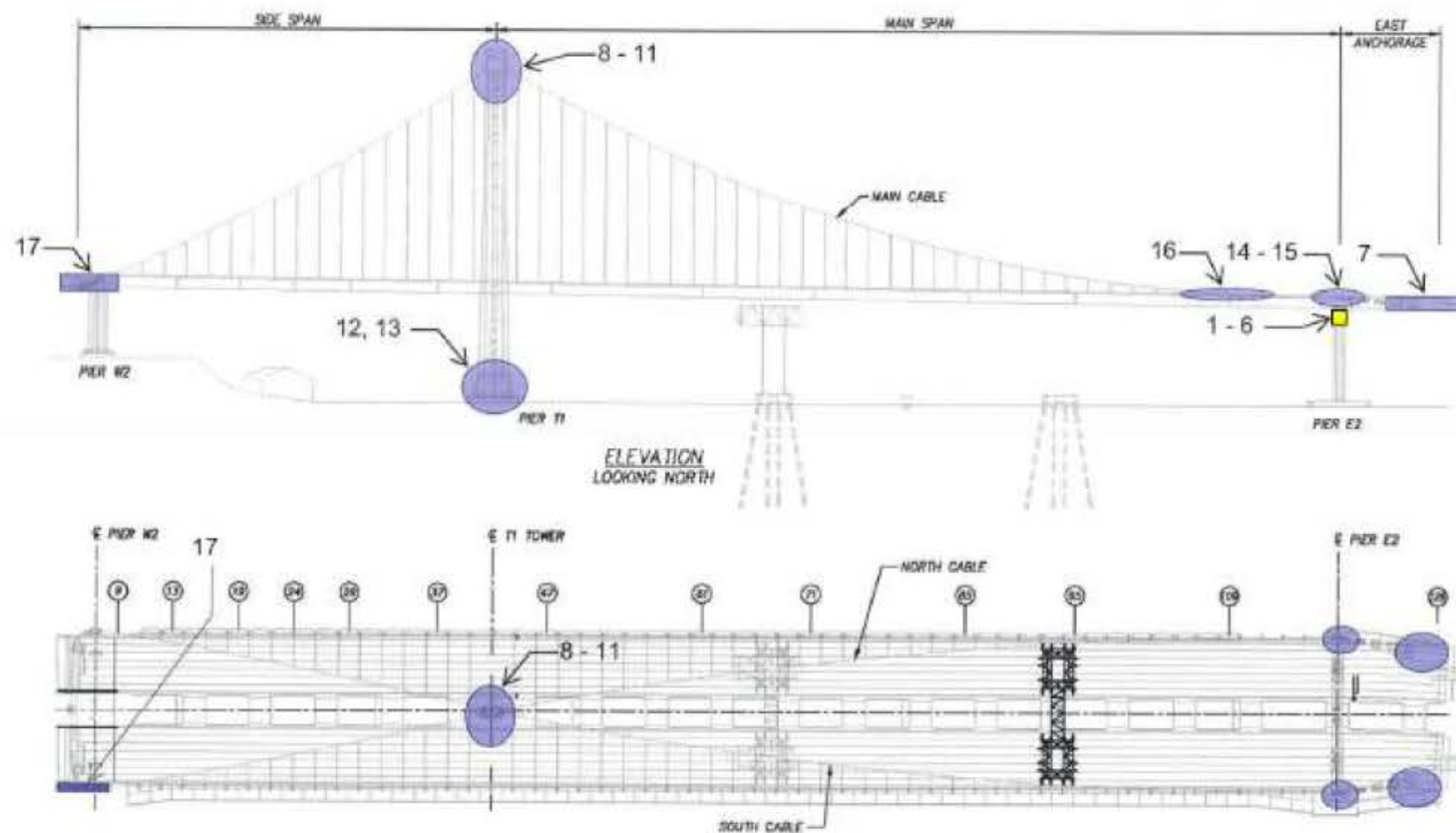
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A354 BD Galvanized Rods

Location	Item No.	Description	Quantity Installed	Diameter (in)	Tension (fraction of Fu)	Average Hardness
E2	1	2008 Shear Keys Bolts	96	3	0.7	37
	2	2010 Shear Keys and Bearing Bolts	192	3	0.7	34
	3	Upper Shear Key OBG Connections	320	3	0.7	35
	4	Upper Bearing OBG Connections	224	2	0.7	35
	5	Bearing Assembly Bolts for Bushings	96	1	0.6	36
	6	Bearing Assembly Bolts for Retaining Rings	336	1	0.4	35
Anchorage	7	PWS Anchor Rods	274	3.5	0.4	35
Top of Tower	8	Saddle Tie Rods	25	4	0.4	35
	9	Saddle Segment Splices	108	3	0.1 - 0.5	37
	10	Saddle to Grillage Anchor Bolts	90	3	0.1	34
	11	Outrigger Boom	4	3	0.1	39
Bottom of Tower	12	Anchor Rods 3"	388	3	0.5	34
	13	Anchor Rods 4"	36	4	0.4	33
East Saddles	14	East Saddle Anchor Rods	32	2	0.1	37
	15	East Saddle Tie Rods	18	3	0.1	33
East Cable	16	Cable Bands	24	3	0.2	36
W2	17	Bikepath Anchor Rods	43	1 3/16	tbd	36.3
Total			2306			



ASTM A354 Grade BD Rods Across SFOBB-SAS



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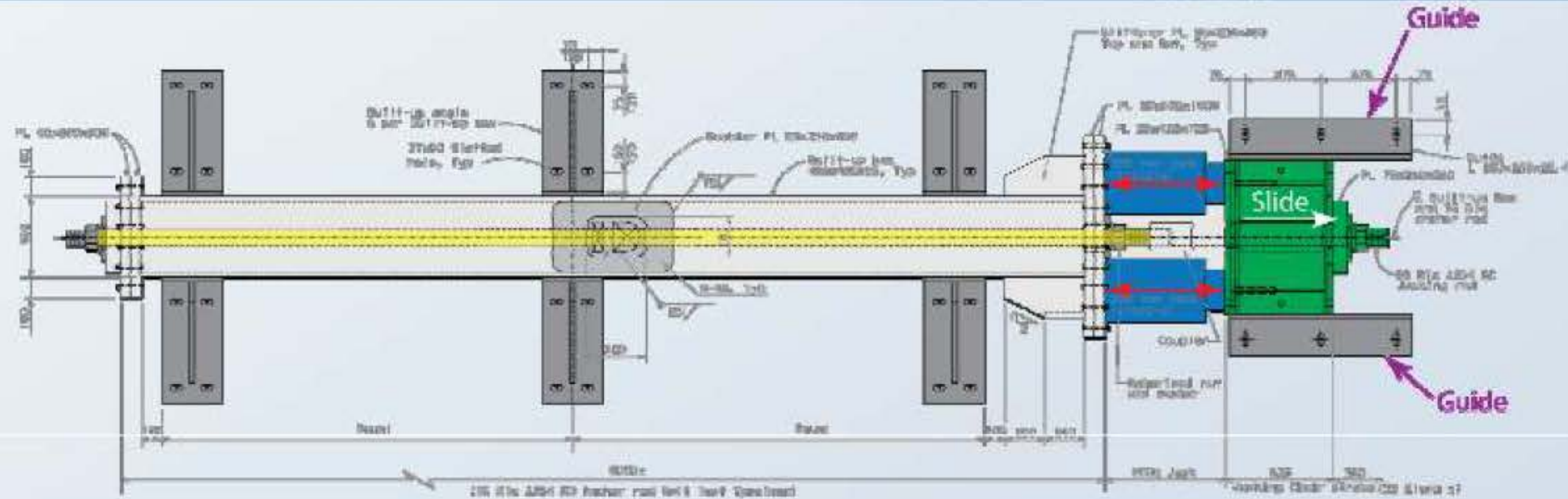
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Townsend Wet Testing

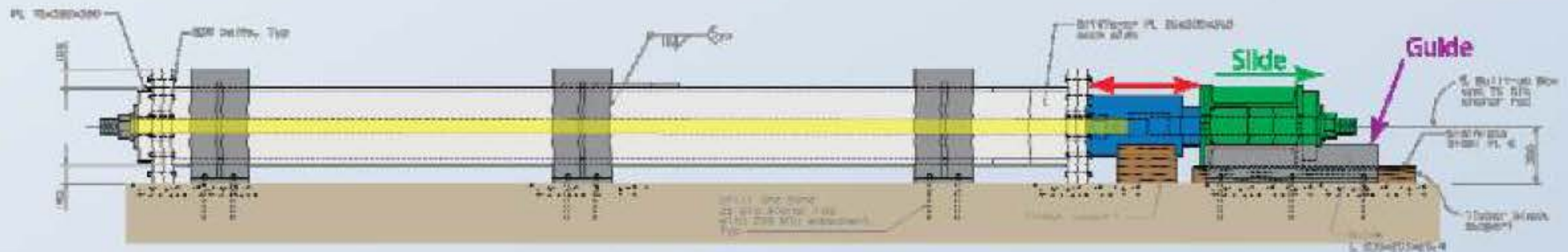
- A “wet” test is an accelerated test being prepared to determine the longer term susceptibility of the material to stress corrosion.
- Full sized bolts will be soaked in a controlled concentrated salt solution while tensioned progressively over a number of days until failure.
- Data from this test will be used to determine the susceptibility of the material to stress over time and under various loads.



Townsend Test Rig



LAYOUT PLAN



ELEVATION



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Stress Corrosion

- Long term stress corrosion susceptibility is a function of the size and hardness of material, and level of tensioning.
- With the “wet” testing data, staff will be able to evaluate all similar high-strength bolts used on the project and help determine if additional remedial action is needed.

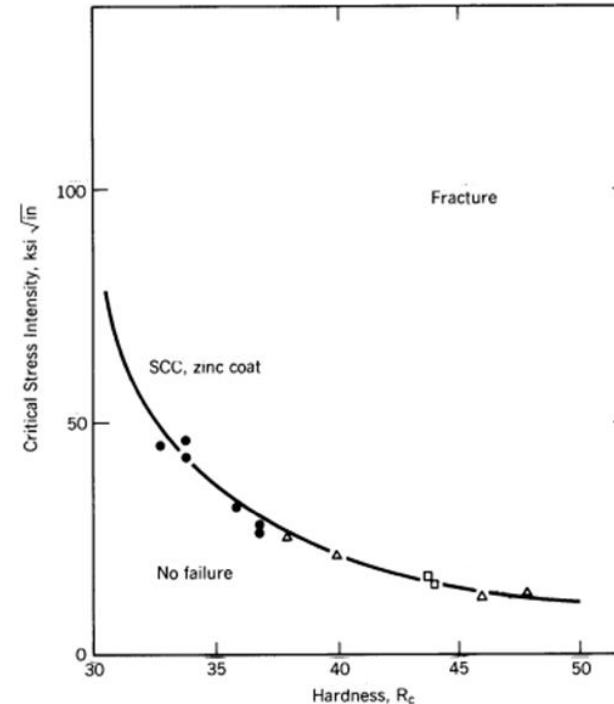


Fig 4.28. Critical Stress intensities in presence of corrosive environment;
● K_{sc} , hot-dip Al-Zn; ▲ K_{sc} , electroplated zinc; ■ K_{sc} , hot-dip zinc.

Sample Critical Stress Curve from *Guide to Design Criteria for Bolted and Riveted Joints 2nd Edition* authored by Geoffrey Kulak, John Fisher, and John Struik and published by American Institute of Steel Construction



What to do with similar bolts on SAS?

- 1. Replace before SSO**
- 2. Replace after SSO**
- 3. Modify by dehumidifying or reducing tension.**
- 4. On-going monitoring and maintenance**



FHWA Independent Review

- The TBPOC has requested that the Federal Highway Administration (FHWA) conduct an additional independent review of our findings and recommendations concerning the bolts on the SAS.
- FHWA has accepted the request and will be reviewing our investigation and findings.



Toll Bridge Seismic Peer Review Panel

- **Dr. Frieder Seible, Dean Emeritus of the Jacobs School of Engineering at the University of California at San Diego, has consulted on many of the world's long-span bridges and has extensively published related to seismic design and blast resistant design of critical structures.**
- **Dr. I.M. Idriss, Emeritus Professor of Civil Engineering at the University of California at Davis, is a Geotechnical Engineer who has performed follow-up analysis of every major earthquake since the 1964 Alaska quake and has been part of numerous engineering teams to analyze damage and determine causes of structural collapse.**
- **Dr. John Fisher, Professor Emeritus of Civil Engineering at Lehigh University, has focused his research on the behavior and performance of steel bridges and has examined most of the major failures of steel structures in America throughout the last four decades, including the World Trade Center in 2001.**
- **All three are members of the National Academy of Engineering.**



Seismic Innovation

- **Awaiting slides on**
 - **Saba's ground motion comparison between 1500 sas and 1000 asshto standard**
 - **Video sims of hinges and shear keys?**
 - **Design life comparision between standard and SAS**
 - **Other corrision protections in place?**



SAS Ground Motions

- Awaiting slide describing visually bay bridge 1500 year ground motions vs 1000 year aashto standard



SAS Design Life

- **Awaiting slide describing bay bridge design life of 150 years vs 75 years for standard bridge and 100 for other monumental bridges**



Corrosion Protection

- **Awaiting slide describing corrosion protection activities.**



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Seismic Innovations



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Items Expected by July 10 BATA Oversight Meeting

- **Completion date of E2 2008 bolt retrofit.**
- **Decision on other similar bolts on SAS**
- **Decision on Seismic Safety Opening Date of Bay Bridge.**

